AUTOMATIC CONTRIBUTION OF LONG-TERM KNOWLEDGE TO VERBAL SHORT-TERM MEMORY

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EWOMS VIII

Introduction & Aim

Verbal short-term memory (VSTM) and long-term memory (LTM) closely interact, with items easier to activate in linguistic LTM leading to higher VSTM span. These effects are explained by language-based models of VSTM assuming fast and automatic interactions between VSTM and LTM (Martin, Saffran, & Dell, 1996; Majerus, 2013). However, direct evidence for automatic VSTM-LTM interactions is scant. The purpose of the present study was to test the degree of automaticity of VSTM-LTM interactions using fast running-span procedures minimizing the intervention of strategic processes during VSTM encoding and maintenance.

We manipulated, in 4 experiments, several psycholinguistic effects assessing access to phonological, lexical and/or semantic knowledge in automatic encoding VSTM tasks.

Methods

Running-span procedure. Participants encoded and recalled verbal lists of **unpredictable length** (6, 9 or 12), with verbal items being presented auditorily and at a **very fast rate** (2.5 items/s) (**Fig. 1**). At the end of the list, participants were instructed to **recall in order any items they could remember, by starting from the end of the list**.

Experiment 1. Participants (*N* = 39) recalled lists composed of either words or nonwords (**lexicality effect**). All stimuli were matched for phonotactic frequency and phonological length.

Experiment 2. Participants (*N* = 42) recalled lists composed of high or low frequency words (**lexical frequency effect**). All stimuli were matched for imageability and phonological length.

Experiment 3. Participants (*N* = 47) recalled lists of words drawn from similar or dissimilar semantic categories (**relatedeness effect**).

Experiment 4. Participants (*N* = 46) recalled lists composed of high or low imageability words (**imageability effect**). All stimuli were matched for lexical frequency and phonological length.

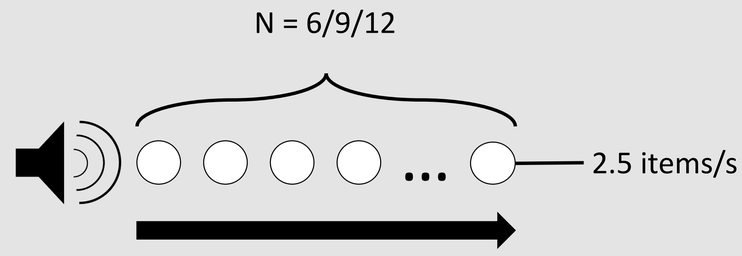
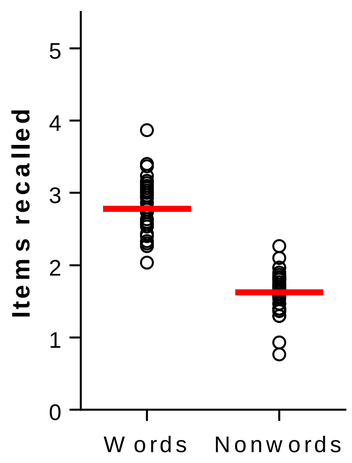


Figure 1. During the encoding phase of the running-span procedure, participants heard verbal items presented at a very fast rate. List length varied between 6, 9 and 12 items and was unpredictable for the participants.

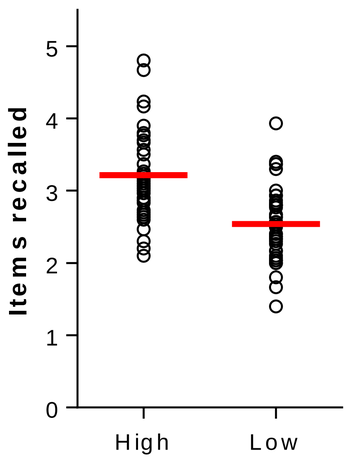
Results

Lexicality effect



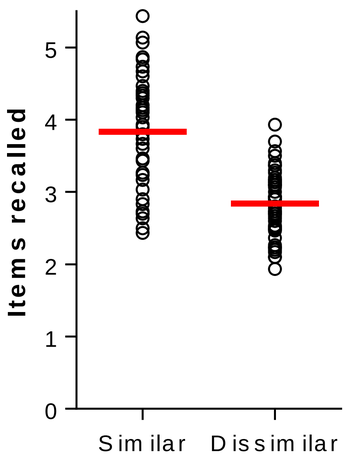
$p < .001$, $d = 2.996$
$BF_{10} = 4.678^{e}+17$

Lexical frequency effect



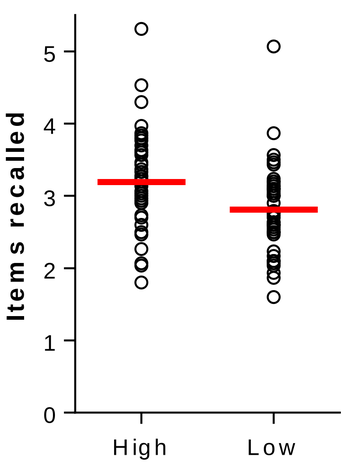
$p < .001$, $d = 2.237$
$BF_{10} = 5.567^{e}+14$

Relatedeness effect



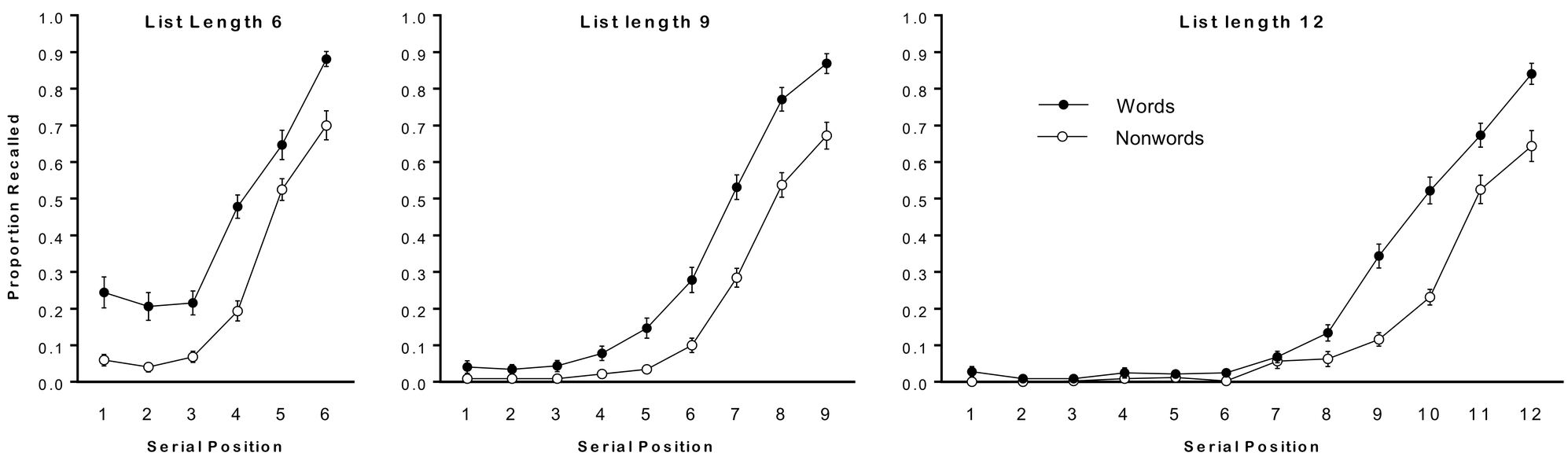
$p < .001$, $d = 2.273$
$BF_{10} = 8.422^{e}+16$

Imageability effect



$p < .001$, $d = 1.164$
$BF_{10} = 2.207^{e}+7$

Serial position curves – Lexicality effect



Discussion & conclusion

Robust LTM effects were observed during all automatic encoding VSTM tasks. VSTM span was higher for:

- Words *vs.* nonwords
- High *vs.* low frequency words
- Semantically related *vs.* unrelated words
- High *vs.* low imageability words

The very strong recency effects and the zero primacy effect confirm automatic encoding during the running-span task.

This study provides strong and novel evidence for the grounding of VSTM in linguistic LTM, by demonstrating the existence of very fast and non-strategic interactions between VSTM and the properties of linguistic LTM.

References

Martin, N., Saffran, E. M., & Dell, G. S., N. (1996). Recovery in deep dysphasia: Evidence for a relation between auditory–verbal STM capacity and lexical errors in repetition. *Brain and Language*, 52(1), 83–113.
Majerus, S. (2013). Language repetition and short-term memory: an integrative framework. *Frontiers in Human Neuroscience*, 7.

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